

PREVALENCE AND IMPACT OF DYSFUNCTIONAL BREATHING PATTERNS IN MUSCULOSKELETAL DISORDERS

¹Prof. (Dr.) Aditi Singh, ²Amit Choudhary

¹Professor & HoD, ²BPT Final year student

¹Department of Physiotherapy

¹Jagannath University, Jaipur, Rajasthan, India

Abstract : Dysfunctional breathing (DB) refers to chronic changes in breathing patterns that result in dyspnea and other non-respiratory symptoms, which cannot be fully explained by organic disease. While traditionally associated with respiratory conditions like asthma, emerging evidence suggests a bidirectional relationship between breathing mechanics and musculoskeletal health. This review synthesizes current research regarding the prevalence of DB in patients with musculoskeletal disorders (MSDs) and the biomechanical impact of altered respiratory patterns on postural stability, spinal control, and chronic pain syndromes. Analysis of eight key studies indicates that DB acts as both a contributor to and a consequence of musculoskeletal dysfunction, particularly in cases of chronic low back pain, fibromyalgia, and neck instability. The findings underscore the necessity of integrated respiratory-musculoskeletal assessment in clinical physiotherapy to improve patient Outcomes.

Keywords: *Dysfunctional breathing, Musculoskeletal disorders, Diaphragm, Postural control, Chronic pain, Respiratory mechanics.*

INTRODUCTION

Breathing is a fundamental physiological process that serves both metabolic and mechanical functions. Beyond gas exchange, the respiratory system—specifically the diaphragm and its associated musculature—1 plays a critical role in maintaining core stability and postural integrity. Dysfunctional breathing (DB), characterized by biomechanical alterations such as thoracic dominance and paradoxical movement, has recently gained attention in the field of orthopedics and physical therapy (Vidotto et al., 2019).

The prevalence of DB in the general population is estimated at roughly 10%, but this figure rises significantly in cohorts suffering from chronic pain or functional movement limitations. In musculoskeletal disorders (MSDs), the diaphragm often loses its primary role as a dynamic stabilizer of the trunk. This shift necessitates the over-recruitment of accessory muscles, such as the scalenes, sternocleidomastoid, and upper trapezius, leading to secondary complications in the cervical and thoracic regions (Bradley & Esformes, 2014).

This review aims to explore the prevalence of these breathing abnormalities across various MSDs and analyze how altered mechanics influence the progression of pain and movement dysfunction. By integrating data from recent literature, this paper provides a comprehensive overview of why "how we breathe" is as important as "how we move" in musculoskeletal rehabilitation.

2. Defining Dysfunctional Breathing in a Biomechanical Context

Dysfunctional breathing is an umbrella term encompassing various patterns, including hyperventilation syndrome and biomechanical breathing pattern disorders (BPD). Unlike organic respiratory diseases like COPD, DB is often a functional issue where the mechanics of breathing are inefficient. According to Vlemincx (2023), DB should be viewed through a transdiagnostic lens. It is not merely a respiratory issue but a manifestation of physiological and psychological stress that impacts the entire kinetic chain. In patients with musculoskeletal pain, the "feed-forward" mechanism of the diaphragm is often impaired. Under normal conditions, the diaphragm contracts before limb movement to increase intraabdominal pressure (IAP) and stabilize the spine. In DB, this anticipatory stabilization is delayed or absent, leaving the lumbar spine vulnerable to mechanical stress.

3. Prevalence in Musculoskeletal Populations

Research indicates a disproportionately high incidence of DB among patients with chronic pain syndromes. The following sections detail specific disorders where prevalence has been documented.

3.1. Chronic Low Back Pain (CLBP)

The correlation between CLBP and DB is well-documented. A significant percentage of individuals with chronic spinal instability exhibit abnormal CO₂ levels and thoracic-dominant breathing. The diaphragm's dual role (respiration and stabilization) means that dysfunction in one area inevitably affects the other. Studies have shown that CLBP patients exhibit smaller diaphragmatic excursions and a higher position of the diaphragm compared to healthy controls.

3.2. Fibromyalgia and Widespread Pain

Fibromyalgia is perhaps the most prominent MSD where respiratory disturbances are pervasive. Ortiz-Rubio et al. (2021) conducted a meta-analysis demonstrating that fibromyalgia patients suffer from significantly reduced chest expansion and respiratory muscle weakness. The prevalence of DB in this population is estimated to be as high as 40-60%. The impact is cyclical: pain leads to shallow breathing, which reduces CO₂ levels, causing muscular hypertonicity and increased pain sensitivity.

4. Biomechanical Impact on the Kinetic Chain

The mechanical consequences of DB extend from the cranium to the pelvis. When the diaphragm fails to descend adequately, several compensations occur: Cervical Overload: Overuse of accessory muscles leads to chronic tension in the neck and shoulders, contributing to cervicogenic headaches and thoracic outlet syndrome.

Impaired Core Stability: Failure to generate adequate intra-abdominal pressure reduces the "hydraulic amplifier" effect that protects the lumbar vertebrae.

Pelvic Floor Dysfunction: There is a direct functional link between the diaphragm and the pelvic floor; asynchronous movement between these two "pumps" often leads to pelvic instability.

5. The Diaphragm as a Link: Stability vs. Respiration

Bradley and Esformes (2014) emphasize that the diaphragm is the cornerstone of functional movement. When breathing patterns are dysfunctional, the "stability" function of the diaphragm is sacrificed for the "respiratory" function. This trade-off is central to the development of MSDs. If a patient is unable to maintain a stable core during movement due to poor breathing, they will inevitably develop compensatory movement patterns that lead to joint wear and muscular imbalances.

6. Assessment and Diagnostic Challenges

Identifying DB in clinical practice remains a challenge. Grillo et al. (2023) highlighted that while physiotherapists recognize the importance of breathing, standardized assessment tools are underutilized.

Common methods include:

Assessment Tool	Description	Clinical Utility
Nijmegen Questionnaire	A 16-item screening for symptoms related to hyperventilation.	High sensitivity for identifying BPD. Hi-Lo Test Detects thoracic dominance.
Hi-Lo Test	Manual assessment of chest vs. abdominal expansion.	Detects thoracic dominance.
Breath-Hold Time	Measures the duration a patient can comfortably hold their breath.	Indicates CO ₂ tolerance and metabolic efficiency.

7. Impact on Rehabilitation and Performance

For athletes and highly active individuals, DB can be a hidden limiter of performance and a precursor to injury. Sikora et al. (2024) observed that even in endurance-trained athletes, subtle BPDs can alter pulmonary function and lead to early fatigue. In a musculoskeletal context, this fatigue results in a breakdown of form, increasing the risk of acute injuries like ligament tears or muscle strains. Rehabilitation programs that fail to address breathing often see high rates of recurrence. If the underlying respiratory mechanic is not corrected, the patient will continue to load their musculoskeletal system inefficiently as soon as they return to daily activities.

8. Discussion: The Bidirectional Relationship

The relationship between DB and MSDs is bidirectional. Chronic pain can induce a "fight or flight" response, leading to rapid, shallow breathing. Conversely, a primary BPD (perhaps induced by stress or poor posture) can create the mechanical environment necessary for chronic pain to develop. This review suggests that clinicians should treat the respiratory system as an integral part of the musculoskeletal system rather than a separate entity.

Future research should focus on longitudinal studies to determine whether correcting breathing patterns can prevent the onset of chronic MSDs in high-risk populations, such as office workers or high-impact athletes.

9. Conclusion

The prevalence of dysfunctional breathing in musculoskeletal disorders is a significant clinical finding that is often overlooked. From the thoracic dominance observed in neck pain to the reduced respiratory capacity in fibromyalgia, the impact of breathing on movement quality is profound. By integrating respiratory education and diaphragmatic retraining into standard orthopedic protocols, practitioners can address the root mechanical causes of dysfunction rather than just the symptomatic pain.

10. References

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